

# Adult

Updated 2008





# Table of Contents

Asthma	4
Description	4
Causes of Asthma	4
Utah Prevalence	6
Diagnosis of Asthma	10
Education for Partnership in Care	12
Key Educational Messages	12
Self-management	13
Environmental Factors	14
Co-morbid Conditions	15
Managing Asthma	16
Medications	18
Stepwise Approach	18
Special Situations	23
Exercised-induced Bronchospasm	23
Pregnancy	23
Disparities	23
Work-related Asthma	24
Seniors and Asthma	25
Additional Resources	27

# Asthma--Description

Asthma is a complex disorder characterized by:

- Variable and recurring symptoms
- Airflow obstruction
- Bronchial hyperresponsiveness
- Underlying inflammation

## Working definition of asthma is as follows:

Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role: in particular mast cells, eosinophils, neutrophils (especially in sudden onset, fatal exacerbations, occupational asthma, and patients who smoke), T- lymphocytes, macrophages, and epithelial cells. In susceptible individuals, this inflammation causes recurrent episodes of coughing (particularly at night or early in the morning), wheezing, breathlessness, and chest tightness. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment.

## **Airflow limitation is caused by a variety of changes in the airway, all influenced by airway inflammation:**

- Bronchoconstriction—bronchial smooth muscle contraction that quickly narrows the airways in response to exposure to a variety of stimuli, including allergens or irritants.
- Airway hyperresponsiveness—an exaggerated bronchoconstrictor response to stimuli.
- Airway edema—as the disease becomes more persistent and inflammation becomes more progressive, edema, mucus hypersecretion, and formation of inspissated mucus plugs further limit airflow.

Remodeling of airways may occur. Reversibility of airflow limitation may be incomplete in some patients. Persistent changes in airway structure occur, including sub-basement fibrosis, mucus hypersecretion, injury to epithelial cells, smooth muscle hypertrophy, and angiogenesis.

## Causes of Asthma

The development of asthma appears to involve the interplay between host factors (particularly genetics) and environmental exposures that occur at a crucial time in the development of the immune system. A definitive cause of the inflammatory process leading to asthma has not yet been established. The following are causes of asthma at different levels:

- Innate immunity
- Genetics
- Environmental factors
  - Airborne allergens
  - Viral respiratory infections

*Characteristics of asthma include: airway obstruction, inflammation, and hyperresponsiveness.*

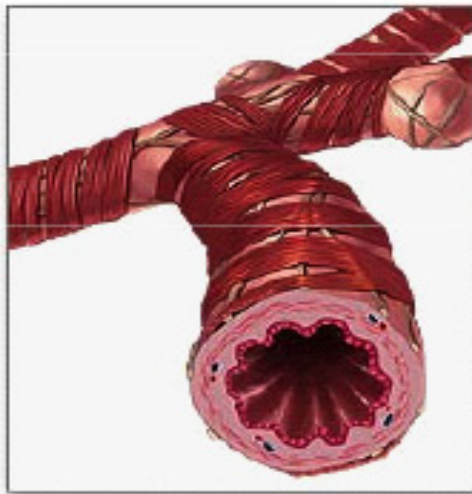
*The development of asthma appears to involve the interplay between host factors (particularly genetics) and environmental exposures that occur at a crucial time in the development of the immune system.*

- Tobacco smoke
- Air pollution
- Diet

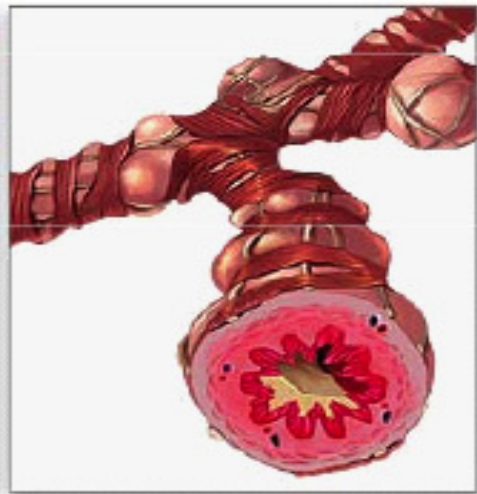
*Asthma has an inheritable component, but the genetics involved remains complex.*

Knowledge of the importance of inflammation to the central features of asthma continues to expand and underscores inflammation as a primary target of treatment. Studies indicate that current therapeutic approaches are effective in controlling symptoms, reducing airflow limitation, and preventing exacerbations, but currently available treatments do not appear to prevent the progression of asthma in children. As various phenotypes of asthma are identified and inflammatory and genetic factors become more apparent, new therapeutic approaches may be developed that will allow even greater specificity to tailor treatment to the individual patient's needs and circumstances.

Normal Bronchiole



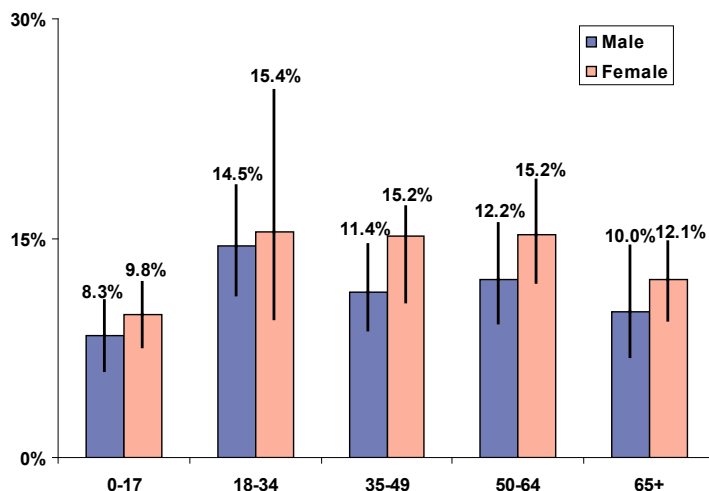
Asthmatic Bronchiole



## Utah Prevalence

Prevalence rates for those who have ever been diagnosed with asthma over the lifespan are higher for females than males in every age group.

### Prevalence of Asthma by Age and Sex for Those Who Ever Had Asthma, 2006.

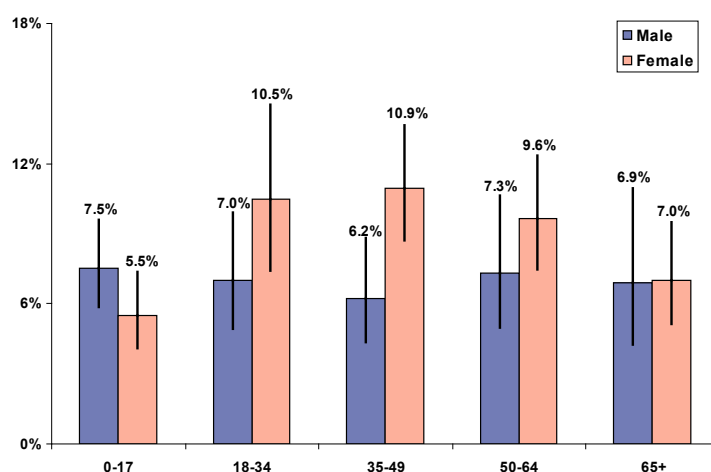


Source: Behavioral Risk Factor Surveillance System, 2006, crude rates.

Prevalence rates for those who have ever been diagnosed with asthma over the lifespan are higher for females than males in every age group. Those in the 18-34 age group show the highest prevalence of any group for both males and females having been diagnosed with asthma.

Current prevalence of asthma is defined as those who responded that they had ever been diagnosed by a doctor or other health professional as having asthma and who reported that they currently have asthma.

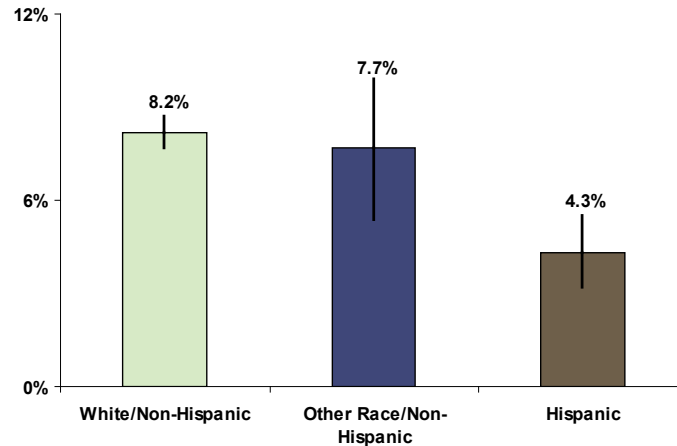
### Prevalence of Current Asthma by Age and Sex, 2006.



Source: Behavioral Risk Factor Surveillance System, 2006, crude rates.

Current prevalence of asthma is defined as those who responded that they had ever been diagnosed by a doctor or other health professional as having asthma and who reported that they currently have asthma. Males appeared to have a higher rate only in the 0-17 age group. Thereafter, females maintain a higher rate throughout the lifespan.

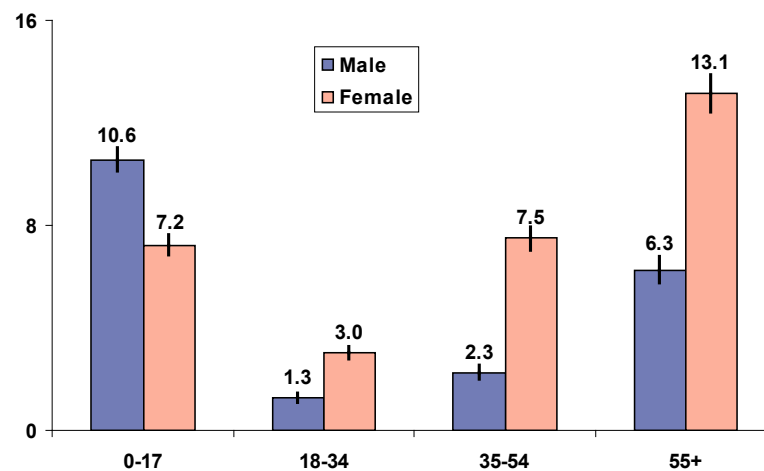
## Prevalence of Asthma by Ethnicity, Adults 18 and Over, 2002-2006.



Source: Behavioral Risk Factor Surveillance System, 2006, crude rates.

Survey participants who responded that they were Hispanic had just over half the rate (4.3%) of asthma compared to White/non-Hispanic adults (8.2%).

## Utah Asthma Hospitalizations by Age and Sex, 2001-2005.



**Source:** Utah Hospital Discharge Database, 2001-2005, ICD Code 493. Note: An inpatient discharge occurs when a person who was admitted to a hospital leaves that hospital. A person who has been hospitalized more than once in a given calendar year will be counted multiple times as a discharge and included more than once in the hospital inpatient discharge data set; thus, the numbers in this report are for discharges, not persons.

The number of hospitalizations due to asthma in Utah increased 13.4% in the last decade, from 1,366 in 1996 to 1,549 in 2005. However, asthma hospitalization rates per 10,000 declined slightly from 6.7 per 10,000 in 1996 to 6.1 per 10,000 in 2005.

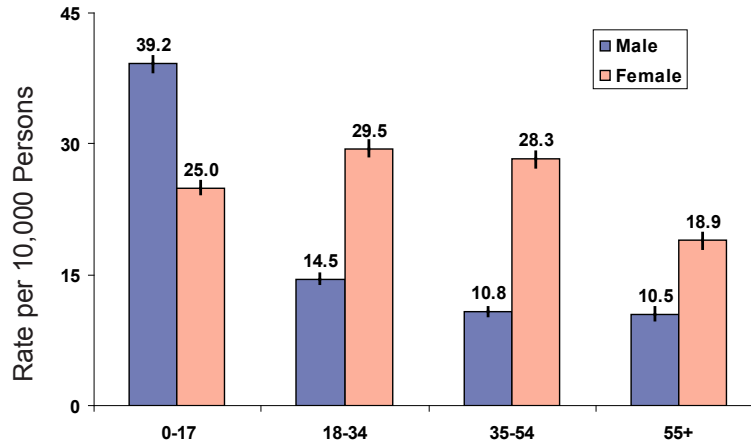
For the years 2001–2005, females in the 55+ age group had the highest asthma hospitalization crude rate of 13.1/10,000 persons, followed by males in the 0-4 age group with a rate of 10.6/10,000 persons.

During 2001–2005, Utah females had higher crude and age-adjusted asthma hospitalization rates at 7.1/10,000 and 7.5/10,000 when compared to males at 5.2/10,000 and 5.0/10,000, respectively.

*The number of hospitalizations due to asthma in Utah increased 13.4% in the last decade. However, asthma hospitalization rates per 10,000 declined slightly from 6.7 in 1996 to 6.1 per 10,000 in 2005.*

## Emergency Department Encounters by Age and Sex, 2001-2005.

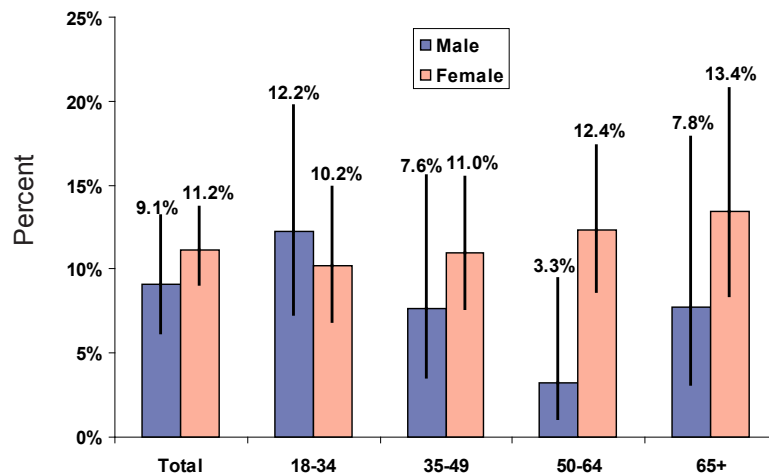
*Male children ages 0-17 had the highest ED encounter rate for asthma.*



Source: Utah Emergency Department Encounter Database, ICD Code 493, 2001-2005.

From 2001 to 2005, ED encounter rates remained stable at approximately 23/10,000 persons. Male children ages 0-17 had the highest ED encounter rate for asthma at 39.2/10,000 persons, followed by females ages 18-34 with a rate of 29.5/10,000 persons.

## Those With Asthma Who Had at Least One Visit to an Emergency Department or Urgent Care Center in the Past 12 Months, Adults 18 and Over, 2003-2006.

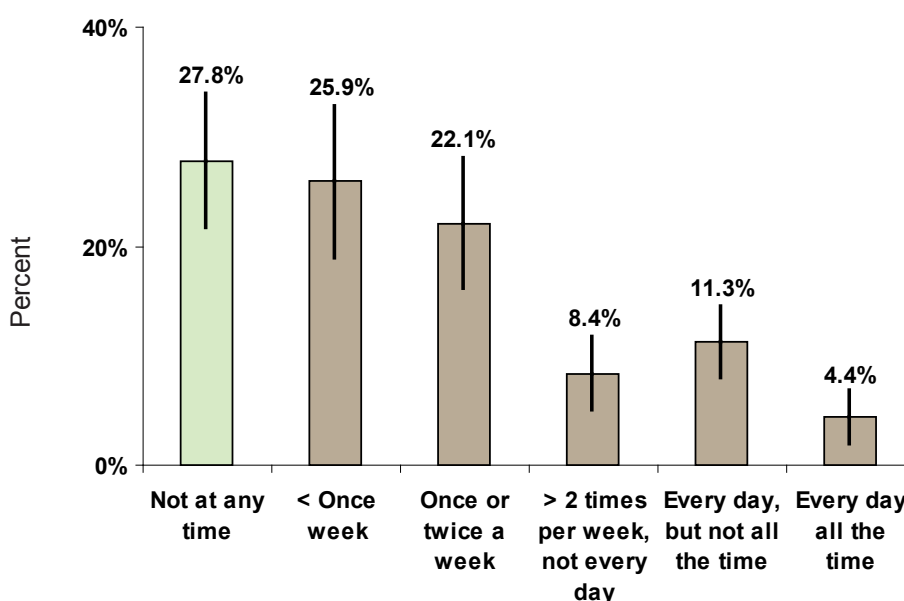


Source: Behavioral Risk Factor Surveillance System, 2003-2006, crude rates.

BRFSS survey data on visits to an emergency department show patterns similar to ED encounter rates collected from the Utah ED Encounter Database.

## Frequency of Asthma Symptoms Over the Past 30 Days, Utah Adults 18 and Over, 2006.

*Of those who suffer from symptoms of asthma, one-quarter (25.9%) reported they have symptoms less than once per week.*

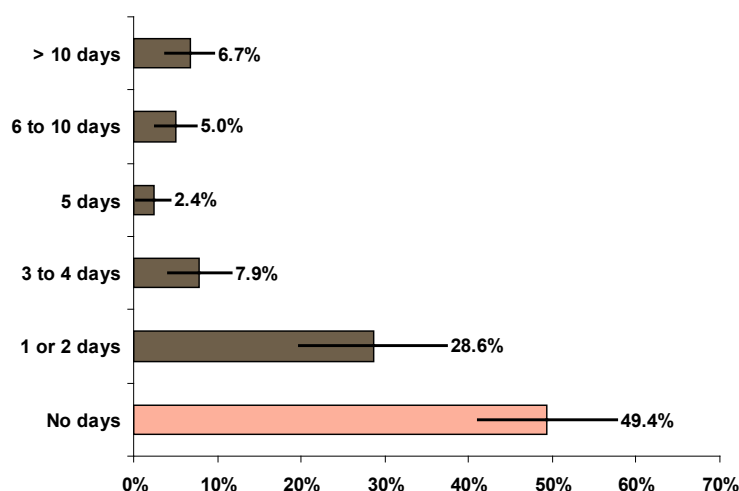


Source: Behavioral Risk Factor Surveillance System, 2006, crude rates.

Of those who suffer from symptoms of asthma, one-quarter (25.9%) reported they have symptoms less than once per week and a little more than one-fifth (22.1%) said they have these symptoms once or twice per week. Just over one-quarter (27.8%) responded that they had not suffered symptoms of asthma at any time in the past month.

## Number of Days of Lost Sleep in the Past 30 Days Due to Symptoms of Asthma, Utah Adults 18 and Over, 2006.

*About one-quarter of respondents (28.6%) reported they had lost 1 or 2 days of sleep in the past 30 days due to symptoms of asthma.*



Source: Behavioral Risk Factor Surveillance System, 2006, crude rates.

About one-quarter of respondents (28.6%) reported they had lost 1 or 2 days of sleep in the past 30 days due to symptoms of asthma. Just over one-fifth (22.0%) had lost 3 or more days of sleep.

*To establish a diagnosis of asthma, the clinician should determine that symptoms of recurrent episodes of airflow obstruction or airway hyper-responsiveness are present; airflow obstruction is at least partially reversible; and alternative diagnoses are excluded.*

*Recurrent episodes of cough and wheezing are most often due to asthma in both children and adults; however, other significant causes of airway obstruction leading to wheeze should be considered.*

## Diagnosis

To establish a diagnosis of asthma, the clinician should determine that symptoms of recurrent episodes of air flow obstruction or airway hyperresponsiveness are present; airflow obstruction is at least partially reversible; and alternative diagnoses are excluded.

### Key symptom indicator of considering a diagnosis of asthma:

\*The presence of multiple key indicators increases the probability of asthma, but spirometry is needed to establish a diagnosis.

- Wheezing—A lack of wheezing and a normal chest examination do not exclude asthma
- History of any of the following:
  - Cough
  - Recurrent wheeze
  - Recurrent difficulty in breathing
  - Recurrent chest tightness
- Symptoms occur or worsen in the presence of:
  - Exercise
  - Viral infection
  - Inhalant allergens (animals, dust mites, mold, pollen)
  - Irritants (tobacco, wood smoke, airborne chemicals)
  - Changes in weather
  - Strong emotional expression (laughing or crying hard)
  - Stress
  - Menstrual cycles
- Symptoms occur or worsen at night, awakening the patient

### Recommended methods to establish the diagnosis are:

- Detailed medical history
  - Symptoms
  - Pattern of symptoms
  - Precipitating and/or aggravating factors
  - Development of disease and treatment
  - Family history
  - Social history
  - History of exacerbations
  - Impact of asthma on patient and family
  - Assessment of patient's and family's perceptions of disease
- Physical examination
  - Upper respiratory tract
    - Increased nasal secretion
    - Mucosal swelling
    - Nasal polyp
  - Chest
    - Sounds of wheezing during normal breathing
    - Prolonged phase of forced exhalation

*A partnership between the clinician, the person who has asthma, and the caregiver is required for effective asthma management.*

- Hyperexpansion of the thorax
  - Use of accessory muscles
  - Appearance of hunched shoulders
  - Chest deformity
- Skin
  - Atopic dermatitis
  - Eczema
- Spirometry
  - Demonstrates obstruction and assesses reversibility in patient  $\geq 5$  years of age.
  - Patients' perceptions of airflow obstruction are highly variable.

Spirometry is an essential objective measure to establish the diagnosis of asthma because the medical history and physical examination are not reliable means of excluding other diagnoses or of assessing lung status.

### **Differential Diagnosis—Adults:**

- Chronic obstructive pulmonary disease (COPD)
- Congestive heart failure (CHF)
- Pulmonary embolism
- Mechanical obstruction (tumors)
- Pulmonary infiltration/eosinophilia
- Cough secondary to drugs (ACE inhibitors)
- Laryngeal dysfunction

Recurrent episodes of cough and wheezing are most often due to asthma in both children and adults; however, other significant causes of airway obstruction leading to wheeze must be considered both in the initial diagnosis and if there is not clear response to initial therapy.

### **Common diagnostic challenges include:**

- Cough variant asthma—cough can be the principal, or only, manifestation of asthma, especially in young children.
- Vocal cord dysfunction (VCD)—can mimic asthma, but it is a distinct disorder. VCD may coexist with asthma, but asthma medications typically do little if anything to relieve VCD symptoms.
- Gastroesophageal reflux disease (GERD), obstructive sleep apnea (OSA), and allergic bronchopulmonary aspergillosis (ABPA)

Consider referral to an asthma specialist if signs and symptoms are atypical, if there are problems with a differential diagnosis, or if additional testing is indicated.

# Education for a Partnership in Care

A partnership between the clinician, the person who has asthma, and the caregiver is required for effective asthma management. By working together, an appropriate treatment can be selected and the patient can learn self-management skills necessary to control asthma. Self-management education improves patient outcomes and can be cost-effective. Self-management education is an integral component of effective asthma care and should be treated as such by health care providers as well as by health care policies and reimbursements.

## Key educational messages: Teach and reinforce at every opportunity

*Self-management education is an integral component of effective asthma care and should be treated as such by health care providers as well as by health care policies and reimbursements.*

### Basic Facts about Asthma

- The contrast between airways of a person who has and a person who does not have asthma; the role of inflammation.
- What happens to the airways during an asthma attack.

### Role of Medications: Understanding the Difference Between:

- Long-term control medications: prevent symptoms, often by reducing inflammation. Must be taken daily. Do not expect them to give quick relief.
- Quick-relief medications: SABAs relax airway muscles to provide prompt relief of symptoms. Do not expect them to provide long-term asthma control. Using SABA > 2 days a week indicates the need for starting or increasing long-term control medications.

### Patient Skills

- Taking medications correctly
  - Inhaler technique (demonstrate to the patient and have the patient return the demonstration).
  - Use of devices as prescribed (e.g., valved holding chamber (VHC) or spacer, nebulizer).
  - Identifying and avoiding environmental exposures that worsen the patient's asthma; e.g., allergens, irritants, tobacco smoke.
- Self-monitoring
  - Assess level of asthma control
  - Monitor symptoms and, if prescribed, peak flow measures.
  - Recognize early signs and symptoms of worsening asthma.
- Using a written asthma action plan to know when and how to:
  - Take daily actions to control asthma
  - Adjust medication in response to signs of worsening asthma
- Seeking medical care as appropriate.

## Adults—Teach Asthma Self-management Skills to Promote Asthma Control

*Teach asthma self-management skills to promote asthma control and develop an active partnership with the patient and family.*

- Provide patients asthma self-management education that includes the following essential items: asthma information and training in:
  - Asthma management skills
  - Self-monitoring (either symptom or peak flow based)
  - Written asthma action plan
  - Regular assessment by a consistent clinician
- Involve patients in decisions about the type of self-monitoring of asthma control that they will do.
- Provide all patients with a written asthma action plan that includes instructions for:
  - Daily management
  - Recognizing and handling worsening asthma (including self-adjustment of medications in response to acute symptoms or changes in PEF measures).
- Written asthma action plans are particularly recommended for patients who have:
  - Moderate or severe persistent asthma
  - A history of severe exacerbations
  - Poorly controlled asthma
- Involve adult patients in treatment decision-making within the context of a therapeutic partnership.
- Health professionals and others trained in asthma self-management education should be used to implement and teach asthma self-management programs.

### **Develop an active partnership with the patient and family by:**

- Establishing open communication that considers cultural and ethnic factors, as well as language and health care literacy needs, of each patient and family.
- Identifying and addressing patient and family concerns about asthma and asthma treatment.
- Developing treatment goals and selecting medications together with the patient and family, allowing full participation in treatment decision-making.
- Encouraging self-monitoring and self-management by reviewing at each opportunity the patient's reports of asthma symptoms and response to treatment.

*Asthma self-management requires repetition and reinforcement.*

### **Provide to all patients a written asthma action plan that includes instruction for daily management, including:**

- Long-term control medication (if appropriate)
- Environmental control measures
- Actions to manage worsening asthma (signs/symptoms, PEF measurements [if used], that indicate worsening asthma; medications to take in response; signs/symptoms that indicate immediate medical care is needed)
- Written asthma action plan (particularly for those with moderate or severe persistent asthma)

### **Integrate asthma self-management education into all aspects of asthma care. Asthma self-management requires repetition and reinforcement.**

- Begin at the time of diagnosis and continue through follow-up care.
- Involve all members of the health care team, including physicians, nurses, pharmacists, respiratory therapists, and asthma educators.
- Reinforce at all points of care where health care professionals interact with patients who have asthma.
- Incorporate individualized case/care management by trained health care professionals for patients who have poorly controlled asthma.
- Use a variety of educational strategies.

### **Encourage patient's adherence to the written asthma action plan by:**

- Choosing treatment that achieves outcomes and addresses preferences that are important to patient.
- Reviewing with patient at each visit the success of the treatment plan.
- Reviewing patient's concerns
- Assessing patient's and family's level of social support.
- Tailoring the self-management approach to the needs and literacy level of the patient.

*Encourage patient's adherence to the written asthma action plan.*

## **Control of Environmental Factors and Co-morbid Conditions**

If patients who have asthma are exposed to irritants or inhalant allergens to which they are sensitive, their asthma symptoms may increase and precipitate an asthma exacerbation. Substantially reducing exposure to these factors may reduce inflammation, symptoms, and need for medication. Several co-morbid conditions can impede asthma management.

*Evaluate the potential role of allergens (particularly inhalant allergens) and irritants.*

## Allergens and irritants:

- Evaluate the potential role of allergens (particularly inhalant allergens) and irritants.
  - Identify allergens and pollutants or irritant exposures. The most important allergens for both children and adults appear to be those that are inhaled.
  - For patients who have persistent asthma, use skin testing or in vitro testing to assess sensitivity to perennial indoor allergens.

## Advise patients who have asthma to reduce exposures to allergens and pollutants or irritants to which they are sensitive.

- Effective allergen avoidance requires a multifaceted, comprehensive approach; single steps alone are generally ineffective.
- Advise patients who have severe, persistent asthma, nasal polyps, or a history of sensitivity to aspirin or non steroidal anti-inflammatory drugs (NSAIDS) about their risk of severe and even fatal exacerbations from using these drugs.
- Indoor air-cleaning devices cannot substitute for more effective dust-mite and cockroach control measures because these particles do not remain airborne. These devices can reduce airborne dog and cat allergens, mold spores, and tobacco smoke. However, most studies do not show an effect on symptoms or lung function.
- Humidifiers or evaporative (swamp) coolers are generally not recommended in homes of patients who are sensitive to dust mites or mold.

*Identify and treat co-morbid conditions that may impede asthma management.*

## Co-morbid Conditions

Identify and treat co-morbid conditions that may impede asthma management. If these conditions are treated appropriately, asthma control may improve.

- Rhinitis or sinusitis
- Gastroesophageal Reflux (GERD)
- Obese or overweight patients
- Obstructive Sleep Apnea
- Allergic Bronchopulmonary Aspergillosis
- Stress and depression

# Managing Asthma Long-Term

## Assessing and monitoring asthma severity and asthma control.

The functions of assessment and monitoring are closely linked to the concepts of severity, control and responsiveness to treatment:

### **Impairment:**

*frequency and intensity of symptoms and functional limitations the patient is currently experiencing or has recently experienced.*

- **Severity:** the intrinsic intensity of the disease process. Severity is most easily and directly measured in a patient who is not receiving long-term control therapy. Severity can also be measured once asthma control is achieved by the step of care required to maintain control
- **Control:** the degree to which the manifestations of asthma are minimized by therapeutic intervention and the goals of therapy are met.
- **Responsiveness:** the ease with which asthma control is achieved by therapy.

## Asthma severity and asthma control include the domains of current impairment and future risk.

- **Impairment:** frequency and intensity of symptoms and functional limitations the patient is currently experiencing or has recently experienced.
- **Risk:** the likelihood of asthma exacerbations, progressive decline in lung function (or, for children, reduced, lung growth), or risk of adverse effects from medication.

***Risk:** the likelihood of asthma exacerbations, progressive decline in lung function, or risk of adverse effects from medication.*

This distinction emphasizes the multifaceted nature of asthma and the need to consider separately asthma's current, ongoing effects on the present quality of life and functional capacity and the future risk of adverse events. The two domains may respond differentially to treatment. For example, evidence demonstrates that some patients can have adequate control of symptoms and minimal day-to-day impairment, but still be at significant risk of exacerbations. These patients should be treated accordingly.

## The concepts of severity and control are used as follows for managing asthma:

- **Assess severity to initiate therapy:** at patient's initial presentation. If the patient is not currently taking long-term control medications, asthma severity is assessed to guide clinical decisions for initiating the appropriate medication and other therapeutic interventions.
- **Assess control to adjust therapy:** once therapy is initiated, the emphasis for clinical management thereafter is changed to the assessment of asthma control. The level of asthma control will guide decisions either to maintain or to adjust therapy.
- **For assessing a patient's overall asthma severity once the most optimal asthma control is achieved and maintained:** asthma severity can be inferred by correlating the level of severity with the lowest level of treatment required to maintain control.

For the initial assessment to characterize the patient's asthma and guide decisions for initiating therapy, use information from the diagnostic evaluation to:

- Classify asthma severity
- Identify precipitating factors for episodic symptoms
- Identify co-morbid conditions
- Assess the patient's knowledge and skills for self-management.

**All patients should be taught how to recognize inadequate asthma control.**

For periodic monitoring of asthma control to guide decisions for maintaining or adjusting therapy:

- Instruct patients to monitor their asthma control in an ongoing manner. **All patients should be taught how to recognize inadequate asthma control.**
  - Either symptom or peak flow monitoring is appropriate for most patients; evidence suggests the benefits are similar.
  - Consider daily peak-flow monitoring for patients who have moderate or severe persistent asthma, patients who have a history of severe exacerbations, and patients who poorly perceive airway obstruction or worsening asthma.
- Monitor asthma control periodically in clinical visits. The frequency of monitoring is a matter of clinical judgment. In general:
  - **Schedule visits at 2- to 6 -week** intervals for patients who are just starting therapy or who require a step up in therapy to achieve or regain asthma control.
  - **Schedule visits at 1- to 6-month** intervals after asthma control is achieved to monitor whether asthma control is maintained. The interval will depend on factors like the duration of asthma control or the level of treatment required.
  - **Consider scheduling visits at 3-month** intervals if a step down in therapy is anticipated.

**Assess asthma control, medication technique, the written asthma action plan, adherence, and patient concerns at every patient visit.**

## Medications

Medications for asthma are categorized into two general classes: long-term control medication and quick-relief medication. Selection of medication includes consideration of the general mechanisms and role of the medication in therapy, delivery devices, and safety.

*All patients should be taught how to recognize inadequate asthma control.*

## General Mechanisms and Role in Therapy

Long-term control medications are used daily to achieve and maintain control of persistent asthma. The most effective are those that attenuate the underlying inflammation characteristic of asthma. Long-term control medications include the following **(listed in alphabetical order)**:

- Corticosteroids
- Cromolyn sodium and nedocromil
- Immunomodulators
- Leukotriene modifiers
- LABAs (salmeterol and formoterol)
- Methylxanthines

Quick-relief medications are used to treat acute symptoms and exacerbations. They include the following (listed in alphabetical order):

- Anticholinergics
- SABAs (albuterol, levalbuterol, and pirbuterol)
- Systemic corticosteroids

## Delivery Devices for Inhaled Medications

**Patients should be instructed in the use of inhaled medications and patient's technique should be reviewed at every patient visit.**

The major advantages of delivering drugs directly into the lungs via inhalation are that higher concentrations can be delivered more effectively to the airways and that systemic side effects are lessened. Inhaled medications or aerosols, are available in a variety of devices that differ in the technique required. To reduce the potential for adverse effects, the following measures are recommended:

- Advise patients to use spacers or VHCs with nonbreath-activated metered-dose inhalers (MDIs) to reduce local side effects. There are no clinical data on use of spacers with ultrafine particle hydrofluoroalkane (HFA) MDIs.
- Advise patient to rinse the mouth (rinse and spit) after inhalation.
- Use the lowest dose of ICS that maintains asthma control.
- Consider adding a LABA, or alternative adjunctive therapy, to a low or medium dose of ICS, rather than using a higher dose of ICS to maintain asthma control.

# Stepwise Approach for Managing Asthma

A stepwise approach to managing asthma is recommended to gain and maintain control of asthma in both the impairment and risk domains.

*Medications for asthma are categorized into two general classes: long-term control medication and quick-relief medication.*

*The major advantages of delivering drugs directly into the lungs via inhalation are that higher concentrations can be delivered more effectively to the airways and that systemic side effects are lessened.*

These domains may respond differentially to treatment. The type, amount, and scheduling of medication is determined by the level of asthma severity or asthma control.

Recommendations for treatment in the different steps are presented in three different age groups (0-4, 5-11, and 12 years and older) because the course of the disease may change over time, the relevance of measures of impairment or risk and the potential short-and long-term impact of medication may be age related, and varied levels of scientific evidence are available for the different ages.

### General principles for all age groups:

- Include medications, patient education, environmental control measures, and management of co-morbidities at each step.
- Monitor asthma control regularly.
- For patients NOT taking long-term control therapy, select treatment based on severity.
- Patients who have persistent asthma require daily long-term control medication.
- Monitor level of asthma control and adjust therapy.
- If possible, identify the minimum amount of medication required to maintain asthma control.

*A stepwise approach to managing asthma is recommended to gain and maintain control of asthma in both the impairment and risk domains.*

### Ages 12 and older

- Involve youths in developing a written asthma action plan
  - Address patient's concerns, preferences, and school schedule in selecting treatment.
  - Encourage students to take a copy of written action plan to school/after-school activities.
- Promote physical activity
  - Treat exercise-induced bronchospasm (EIB). Step up daily therapy if the child has poor endurance or symptoms during normal daily activities.
- Assess possible benefit of treatment in older patients
  - Establish reversibility with a short course of oral systemic corticosteroids.
- Adjust medications to address coexisting medical conditions common among older patients—consider:
  - Calcium and vitamin D supplements for patients who take ICS and have risk factors for osteoporosis.
  - Increased sensitivity to side effects of bronchodilators with increasing age.
  - Increased drug interactions with theophylline
  - Medications for arthritis (NSAIDS)
  - Hypertension
  - Glaucoma medications (beta blockers) may exacerbate asthma.

Promote active participation in physical activities, exercise, and sports because physical activity is an essential part of a person's life.

The stepwise approach and recommended treatments are meant to assist, not replace, the clinical decision-making necessary to determine the most appropriate treatment to meet the individual patient's needs and circumstances.

### Consider a referral to an asthma specialist for consultation or co-management if:

- There are difficulties achieving or maintaining control
- The patient requires >2 bursts of oral systemic corticosteroids in 1 year or has an exacerbation requiring hospitalization.
- Step 4 care or higher is required (step 3 or higher for children 0-4).
- Immunotherapy or omalizumab is considered.
- Additional testing is indicated.

Components of Severity		Classification of Asthma Severity ≥12 years of age			
		Intermittent	Persistent		
			Mild	Moderate	Severe
<b>Impairment</b>  Normal FEV <sub>1</sub> /FVC: 8–19 yr 85% 20–39 yr 80% 40–59 yr 75% 60–80 yr 70%	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2x/month	3–4x/month	>1x/week but not nightly	Often 7x/week
	Short-acting beta <sub>2</sub> -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not daily, and not more than 1x on any day	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited
	Lung function	<ul style="list-style-type: none"><li>• Normal FEV<sub>1</sub> between exacerbations</li><li>• FEV<sub>1</sub> &gt;80% predicted</li><li>• FEV<sub>1</sub>/FVC normal</li></ul>	<ul style="list-style-type: none"><li>• FEV<sub>1</sub> &gt;80% predicted</li><li>• FEV<sub>1</sub>/FVC normal</li></ul>	<ul style="list-style-type: none"><li>• FEV<sub>1</sub> &gt;60% but &lt;80% predicted</li><li>• FEV<sub>1</sub>/FVC reduced 5%</li></ul>	<ul style="list-style-type: none"><li>• FEV<sub>1</sub> &lt;60% predicted</li><li>• FEV<sub>1</sub>/FVC reduced &gt;5%</li></ul>
<b>Risk</b>	Exacerbations requiring oral systemic corticosteroids	0–1/year (see note)	≥2/year (see note)		
		Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time for patients in any severity category. Relative annual risk of exacerbations may be related to FEV <sub>1</sub> .			
<b>Recommended Step for Initiating Treatment</b> (See “Stepwise Approach for Managing Asthma” for treatment steps.)		Step 1	Step 2	Step 3	Step 4 or 5
		and consider short course of oral systemic corticosteroids			
In 2–6 weeks, evaluate level of asthma control that is achieved and adjust therapy accordingly.					

Key: EIB, exercise-induced bronchospasm, FEV<sub>1</sub>, forced expiratory volume in 1 second; FVC, forced vital capacity; ICU, intensive care unit Notes:

- The stepwise approach is meant to assist, not replace, the clinical decisionmaking required to meet individual patient needs.
- Level of severity is determined by assessment of both impairment and risk. Assess impairment domain by patient's/caregiver's recall of previous 2–4 weeks and spirometry. Assign severity to the most severe category in which any feature occurs.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate greater underlying disease severity. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma

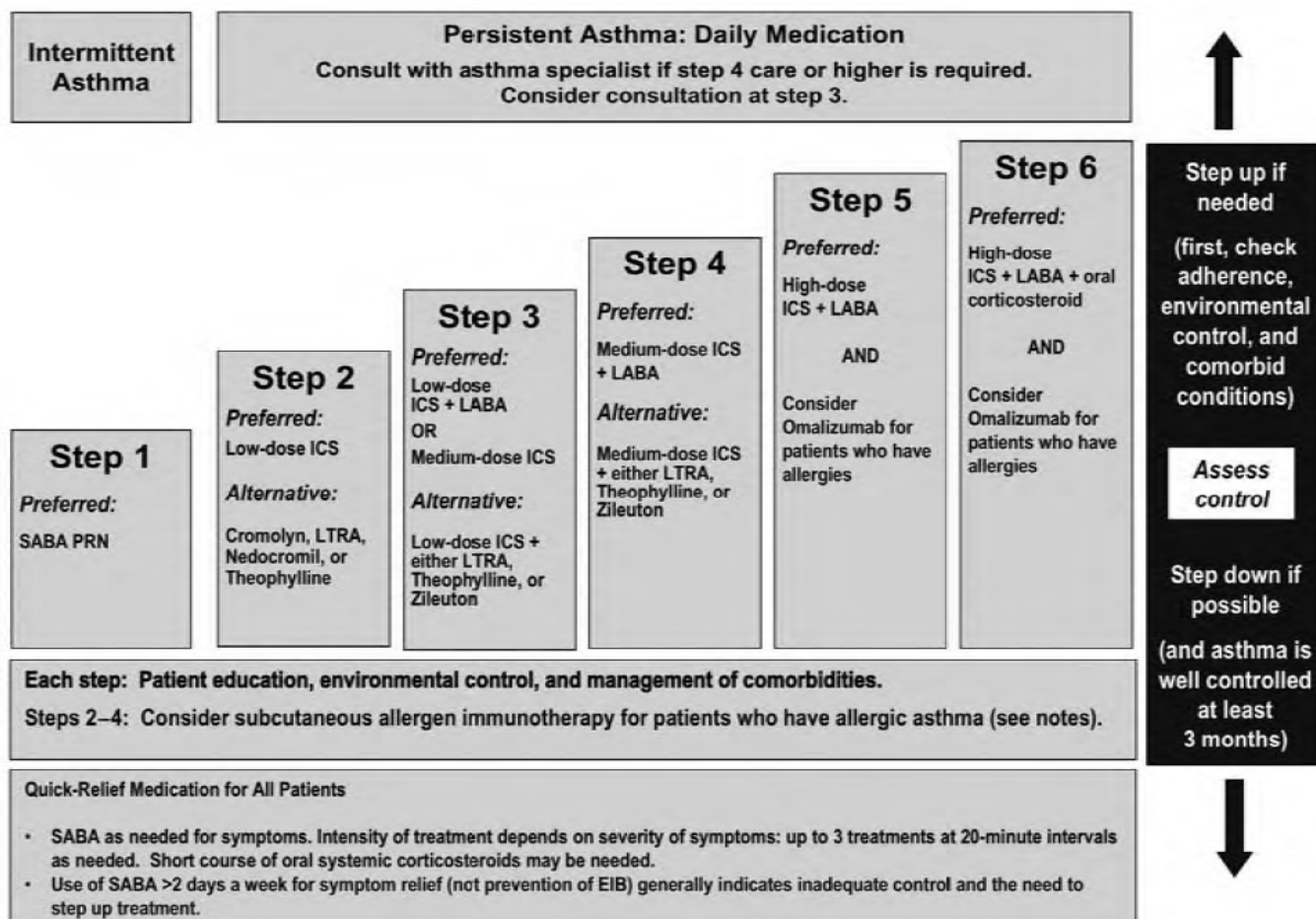
Components of Control		Classification of Asthma Control (≥12 years of age)		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
Impairment	Symptoms	≤2 days/week	>2 days/week	Throughout the day
	Nighttime awakenings	≤2x/month	1–3x/week	≥4x/week
	Interference with normal activity	None	Some limitation	Extremely limited
	Short-acting beta <sub>2</sub> -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per day
	FEV <sub>1</sub> or peak flow	>80% predicted/ personal best	60–80% predicted/ personal best	<60% predicted/ personal best
	Validated questionnaires  ATAQ ACQ ACT	0 ≤0.75* ≥20	1–2 ≥1.5 16–19	3–4 N/A ≤15
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year	≥2/year (see note)	
		Consider severity and interval since last exacerbation		
	Progressive loss of lung function	Evaluation requires long-term followup care.		
	Treatment-related adverse effects	Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.		
Recommended Action for Treatment  (See “Stepwise Approach for Managing Asthma” for treatment steps.)		<ul style="list-style-type: none"><li>• Maintain current step.</li><li>• Regular followup at every 1–6 months to maintain control.</li><li>• Consider step down if well controlled for at least 3 months.</li></ul>	<ul style="list-style-type: none"><li>• Step up 1 step.</li><li>• Reevaluate in 2–6 weeks.</li><li>• For side effects, consider alternative treatment options.</li></ul>	<ul style="list-style-type: none"><li>• Consider short course of oral systemic corticosteroids.</li><li>• Step up 1–2 steps.</li><li>• Reevaluate in 2 weeks.</li><li>• For side effects, consider alternative treatment options.</li></ul>

\*ACQ values of 0.76–1.4 are indeterminate regarding well-controlled asthma.

Key: EIB, exercise-induced bronchospasm; ICU, intensive care unit

Notes:

- The stepwise approach is meant to assist, not replace, the clinical decision making required to meet individual patient needs.
- The level of control is based on the most severe impairment or risk category. Assess impairment domain by patient’s recall of previous 2–4 weeks and by spirometry/or peak flow measures. Symptom assessment for longer periods should reflect a global assessment, such as inquiring whether the patient’s asthma is better or worse since the last visit.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. For treatment purposes, patients who had exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have not-well-controlled asthma, even in the absence of impairment levels consistent with not-well-controlled asthma.
- Review adherence to medication, inhaler technique, environmental control, and comorbid conditions.
- If an alternative treatment option was used in a step, discontinue and use the preferred treatment for that step.



• Step 1, 2, and 3 preferred therapies are based on Evidence A; step 3 alternative therapy is based on Evidence A for LTRA, Evidence B for theophylline, and Evidence D for zileuton. Step 4 preferred therapy is based on Evidence B, and alternative therapy is based on Evidence B for LTRA and theophylline and Evidence D zileuton. Step 5 preferred therapy is based on Evidence B. Step 6 preferred therapy is based on (EPR—2 1997) and Evidence B for omalizumab.

• Immunotherapy for steps 2–4 is based on Evidence B for house-dust mites, animal danders, and pollens; evidence is weak or lacking for molds and cockroaches. Evidence is strongest for immunotherapy with single allergens. The role of allergy in asthma is greater in children than in adults.

• Clinicians who administer immunotherapy or omalizumab should be prepared and equipped to identify and treat anaphylaxis that may occur.

**Key: Alphabetical order is used when more than one**

Treatment option is listed within either preferred or alternative therapy. ICS, inhaled corticosteroid; LABA, long-acting inhaled beta2-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta2-agonist

**Notes:**

• The stepwise approach is meant to assist, not replace, the clinical decision-making required to meet individual patient needs.

• If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.

• Zileuton is a less desirable alternative due to limited studies as adjunctive therapy and the need to monitor liver function. Theophylline requires monitoring of serum concentration levels.

• In step 6, before oral corticosteroids are introduced, a trial of high-dose ICS + LABA + either LTRA, theophylline, or zileuton may be considered, although this approach has not been studied in clinical trials.

# Special Situations

*The stepwise approach and recommended treatments are meant to assist, not replace, the clinical decision-making necessary to determine the most appropriate treatment to meet the individual patient's needs and circumstances.*

## Exercised-induced Bronchospasm (EIB)

- Prevent EIB—treatment strategies to prevent EIB include:
  - Long-term control therapy
  - Pretreatment before exercise with SABA, leukotriene receptor antagonists (LTRAs), cromolyn or nedocromil; frequent or chronic use of long acting beta2-agonist (LABA) for pretreatment is discouraged, as it may disguise poorly-controlled persistent asthma.
  - Warm-up period or a mask or scarf over the mouth for cold-induced EIB.

## Pregnancy

### Maintain asthma control through pregnancy

- Monitor asthma control during all prenatal visits.
- Asthma worsens in one-third of women during pregnancy and improves in one-third—medications should be adjusted accordingly.
- Safer to be treated with asthma medications than to have poorly-controlled asthma.
- Maintaining lung function is important to ensure oxygen supply to fetus.
- Albuterol is the preferred SABA. ICS is the preferred long-term control medication (budesonide is preferred because more data are available on this medication during pregnancy).

## Disparities

Multiple factors contribute to the higher rates of poorly controlled asthma and asthma deaths among Blacks and Latinos compared to Whites. These factors include socioeconomic disparities in access to quality medical care, under-prescription and underutilization of long-term control medication, cultural beliefs and practices about asthma management, and perhaps, biological and pathophysiological differences that affect the underlying severity of asthma and response to treatment.

Heightened awareness of disparities and cultural barriers, improving access to quality of care, and improving communication strategies between clinicians and ethnic or racial minority patients regarding use of asthma medications may improve asthma outcomes.

## Work-related Asthma

Early recognition and control of exposures is particularly important in occupationally induced asthma, because the likelihood of complete resolution of symptoms decreases with time.

### Patterns of symptoms (in relation to work exposures):

- Improvement occurs during vacations or days off (may take a week or more).
- Symptoms may be immediate (<1 hour), delayed (most commonly, 2-8 hours after exposure), or nocturnal.
- Initial symptoms may occur after high-level exposure (e.g., spill).

### Potential for workplace-related symptoms:

- Recognized sensitizers (e.g., isocyanates, plant or animal products).
- Irritants or physical stimuli (e.g., cold/heat, dust, humidity)
- Coworkers may have similar symptoms.

### Documentation of work-relatedness of airflow limitation:

- Serial charting for 2-3 weeks (2 weeks at work and up to 1 week off work, as needed to identify or exclude work-related changes in PEF):
  - Record when symptoms and exposures occur.
  - Record when a bronchodilator is used.
  - Measure and record peak flow (or FEV1) every 2 hours while awake.
- Immunologic tests.
- Referral for further confirmatory evaluation (e.g., bronchial challenges).

## Management

### Work-aggravated asthma:

- Work with onsite health care providers or managers/supervisors.
- Discuss avoidance, ventilation, respiratory protection, tobacco smoke-free environment.

### Occupationally induced asthma:

- Recommend complete cessation of exposure to initiating agent.

**Once asthma is in control, routine follow-up visits should occur every 6-12 months. If asthma is not in control, the patient should be seen every two weeks until control is achieved.**

*Heightened awareness of disparities and cultural barriers, improving access to quality of care, and improving communication strategies between clinicians and ethnic or racial minority patients regarding use of asthma medications may improve asthma outcomes.*

## Seniors and Asthma

*Once asthma is in control, routine follow-up visits should occur every 6-12 months. If asthma is not in control, the patient should be seen every two weeks until control is achieved.*

- Asthma in the elderly is often under-diagnosed and under-treated.
- Asthma can develop later in life; however, it is difficult to diagnose in older adults because of other respiratory and cardiac diseases.
- Medications used to treat other diseases, such as cardiovascular disease, may render asthma rescue medications useless, or can have other unwanted effects.

### Diagnosing asthma and older adults

- Difficult to diagnose.
- Many older adults already have chronic respiratory or cardiovascular conditions that could mask asthma symptoms.
- Asthma may worsen COPD and COPD may worsen asthma. Consider treatments for both possibilities simultaneously.

### Complications and co-morbid conditions

- Cardiovascular conditions present another challenge in treating older adults with asthma. Because some medications used to treat cardiovascular diseases are beta blockers, they may decrease the effect of beta-agonists like bronchodilators. The risks and benefits should be carefully weighed for both conditions.

### Medications and older adults

Medications used to treat asthma in the elderly do not differ significantly from those for younger patients. However, the risk of adverse effects from asthma treatment is greater on long-term management, and the potential for drug interactions is greater because of many coexisting conditions.

- It is important to be aware of coexisting diseases and conditions.
- Monitor patient use of medications and watch for adverse side effects associated with different medications.
  - Beta2-agonist and theophylline use should be monitored carefully because they can cause tachy arrhythmias and aggravate ischemic heart disease. Theophylline should be used with caution, especially in patients with congestive heart failure. Theophylline can cause:
    - Cardiac arrhythmias
    - Nausea and vomiting from gastric irritation
    - Gastroesophageal reflux
    - Insomnia
    - Hypotension
    - Hypertension
    - Tremor
    - Seizures

*Cardiovascular conditions present another challenge in treating older adults with asthma. Some medications use to treat cardiovascular diseases may decrease the effects of asthma medications.*

- Systemic corticosteroids may aggravate congestive heart failure and lower serum potassium with potentially adverse cardiac effects.
- Corticosteroids in high doses may reduce bone mineral content and may accelerate development of osteoporosis. The National Asthma Education Prevention Program notes that older adults are more frequently prescribed oral steroids than inhaled steroids to manage asthma because there are higher risks of side effects with oral steroids ( e.g., bone density, changes in blood sugar level, cataracts, glaucoma). **Inhaled steroids are the preferred method of treatment (a spacer is also recommended).**

**Note:** It is important to establish the appropriateness of asthma medications and doses by regularly evaluating the patient's response to therapy. Review of patient's technique in taking medications is also important; a failure to respond adequately to therapy is often a result of improper medication inhaler technique.

### Non-asthma medications with increased potential for adverse effects in the elderly patient with asthma.

Medication	Co-morbid condition(s) for which drug is prescribed	Adverse effects	Comments
Beta-adrenergic blocking agent	Hypertension Heart Disease Tremor Glaucoma	Worsening asthma Bronchospasm Decreased response to bronchodilator Decreased response to epinephrine in anaphylaxis	Avoid where possible; when must be used, use a highly beta-selective drug
Non-steroidal anti-inflammatory drugs	Arthritis Musculoskeletal diseases	Worsening asthma Bronchospasm	Not all elderly with asthma have non-tolerance of NSAIDs, but are best avoided if possible
Non-potassium sparing diuretics	Hypertension Congestive heart failure	Worsening cardiac function/ dysrhythmias due to hypokalemia	Additive effect with anti-asthma medications that also produce potassium loss (steroids, beta-agonist). Elderly also more likely to be receiving drugs (e.g., digitalis where hypokalemia is of increased concern)
Cholinergic agent	Urinary retention Glaucoma	Bronchospasm Bronchorrhea	Note that some over-the-counter asthma medications contain ephedrine, which could aggravate urinary retention, glaucoma
ACE inhibitors	Heart failure Hypertension	Increased incidence of cough	

## Example: Asthma Action Plan

Date \_\_\_\_\_ Patient name \_\_\_\_\_ DOB \_\_\_\_\_  
 MD \_\_\_\_\_ MRN \_\_\_\_\_ ☐ Reviewed with: guardian/patient Verbalized understanding ☐ yes ☐ no

# Asthma ACTION PLAN

- ☒ Breathing is easy
- ☒ No coughing
- ☒ No wheezing
- ☒ No shortness of breath
- ☒ Can work, play, and sleep easily
- ☒ Using quick-relief medication less than twice a week
- ☒ **PEAK FLOW**  
80%–100% of personal best



Avoid these asthma triggers: \_\_\_\_\_

Take CONTROLLER medication: \_\_\_\_\_

Take QUICK-RELIEF medication:

☐ Before exercise: \_\_\_\_\_

☐ Before exposure to a trigger: \_\_\_\_\_

Keep ORAL STEROIDS on hand in case you fall into STEP 3 of the yellow zone or into the red zone.

- ☒ Using quick-relief medication more than twice a week\*
- ☒ Coughing
- ☒ Wheezing
- ☒ Shortness of breath
- ☒ Difficulty with physical activity
- ☒ Waking at night
- ☒ Tightness in chest
- ☒ **PEAK FLOW**  
50%–80% of personal best



STEP 1: Add QUICK-RELIEF medication:

STEP 2: Monitor your symptoms:

- If symptoms **GO AWAY** quickly, return to the green zone.
- If symptoms **CONTINUE** or return within a few hours:

☐ Add \_\_\_\_\_

STEP 3: Continue monitoring your symptoms:

- If symptoms **CONTINUE** after step 2 treatment:

☐ Add \_\_\_\_\_ oral steroid medication

☐ Call your healthcare provider: \_\_\_\_\_

\*You might need a change in your treatment plan

- ☒ Medication is not helping
- ☒ Breathing is very difficult
- ☒ Cannot walk or play
- ☒ Cannot talk easily
- ☒ **PEAK FLOW**  
Less than 50% of personal best



☐ Call your healthcare provider: \_\_\_\_\_  
 If you can't reach your healthcare provider quickly, go to the nearest hospital emergency room or call 911 immediately.

☐ Go to the hospital emergency room or call 911 immediately.

• If you have an oral steroid at home, take \_\_\_\_\_mg of \_\_\_\_\_ as you leave for the hospital.

• Continue to use your quick-relief medication \_\_\_\_\_ as you go to the emergency room.

*Asthma symptoms can get worse quickly. When in doubt, seek medical help.*

# Additional Resources

American Academy of Allergy, Asthma, and Immunology

[www.aaaai.org/patients/publicedmat/tips/asthmaandpregnancy.stm](http://www.aaaai.org/patients/publicedmat/tips/asthmaandpregnancy.stm)

[www.aaaai.org/patients/seniorsandasthma/gerd.stm](http://www.aaaai.org/patients/seniorsandasthma/gerd.stm)

[www.aaaai.org/patients/seniorsandasthma/asthma\\_emergency.stm](http://www.aaaai.org/patients/seniorsandasthma/asthma_emergency.stm)

[www.aaaai.org/patients/publicedmat/tips/occupationalasthma.stm](http://www.aaaai.org/patients/publicedmat/tips/occupationalasthma.stm)

Environmental Protection Agency

[www.epa.gov/aging/solutions/Solutions6\\_1.pdfma/asthlrc.html](http://www.epa.gov/aging/solutions/Solutions6_1.pdfma/asthlrc.html)

Mayo Clinic

<http://www.mayoclinic.com/health/occupational-asthma/DS00591>

NAEPP Guidelines for Asthma in the Elderly

[http://www.nhlbi.nih.gov/health/prof/lung/asthma/as\\_elder.pdf](http://www.nhlbi.nih.gov/health/prof/lung/asthma/as_elder.pdf)

National Jewish Medical Center

<http://www.njc.org/>

<http://www.nationaljewish.org/disease-info/diseases/asthma/about/types/occupation.aspx>

National Heart, Lung, and Blood Institute

[www.nih.gov/news/pr/jan2005/nhlbi-11.htm](http://www.nih.gov/news/pr/jan2005/nhlbi-11.htm)

<http://www.nhlbi.nih.gov/health/prof/lung/asthma/astpreg.htm>

Occupational Safety and Health Administration (OSHA)

<http://www.osha.gov/SLTC/occupationalasthma/>

<http://Familydoctor.org/040.sml?printxml>

Pregnancy and Asthma

<http://www.aaaai.org/patients/advocate/2003/spring/women.stm>

Womenshealth.gov

[www.womenshealth.gov/pub/steps/Asthma.htm](http://www.womenshealth.gov/pub/steps/Asthma.htm)

Traveling with Asthma

[www.aaaai.org/patients/publicedmat/tips/travelinewithallergies.stm](http://www.aaaai.org/patients/publicedmat/tips/travelinewithallergies.stm)

# References

Lee, P and Tanner, R

**Asthma in Utah 2007 - Update.**

Utah Asthma Program, Bureau of Health Promotion, Utah Department of Health; (2007)

[http://www.health.utah.gov/asthma/pdf\\_files/Data/Burden\\_%20Report.pdf](http://www.health.utah.gov/asthma/pdf_files/Data/Burden_%20Report.pdf)

Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma, Clinical Practice Guidelines.

National Asthma Education and Prevention Program of the National Heart, Lung, and Blood Institute, National Institutes of Health; (2007)

## For more information

The National Heart, Lung, and Blood Institute (NHLBI) Health Information Center is a service of the NHLBI of the National Institutes of Health. The NHLBI Health Information Center provides information to health professionals, patients, and the public about the treatment, diagnosis, and prevention of heart, lung, and blood diseases and sleep disorders. For more information contact:

NHLBI Health Information Center

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Bethesda, MD 20824-0115

Phone: 301-592-8573

Fax: 301-592-8563

Web site: <http://www.nhlbi.nih.gov>

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PO Box 142106

Salt Lake City, Utah 84114-2106

Phone: 801-538-9272

Web site: [www.health.utah.gov/asthma](http://www.health.utah.gov/asthma)



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